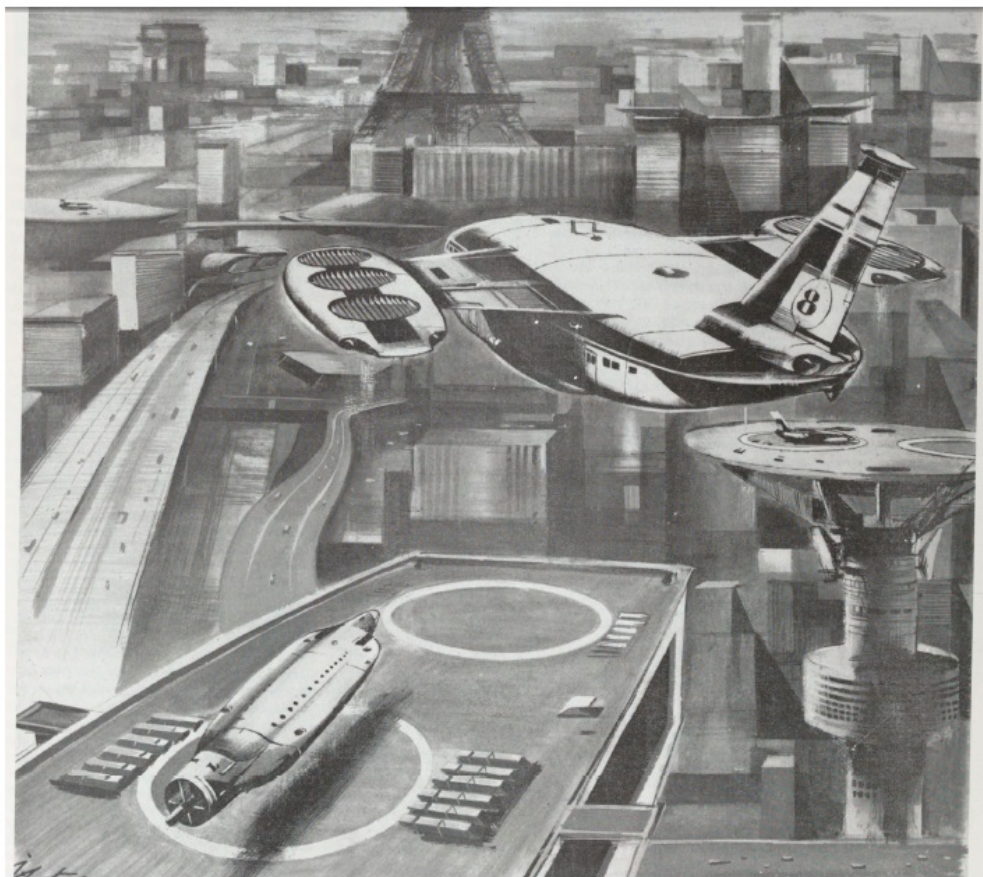
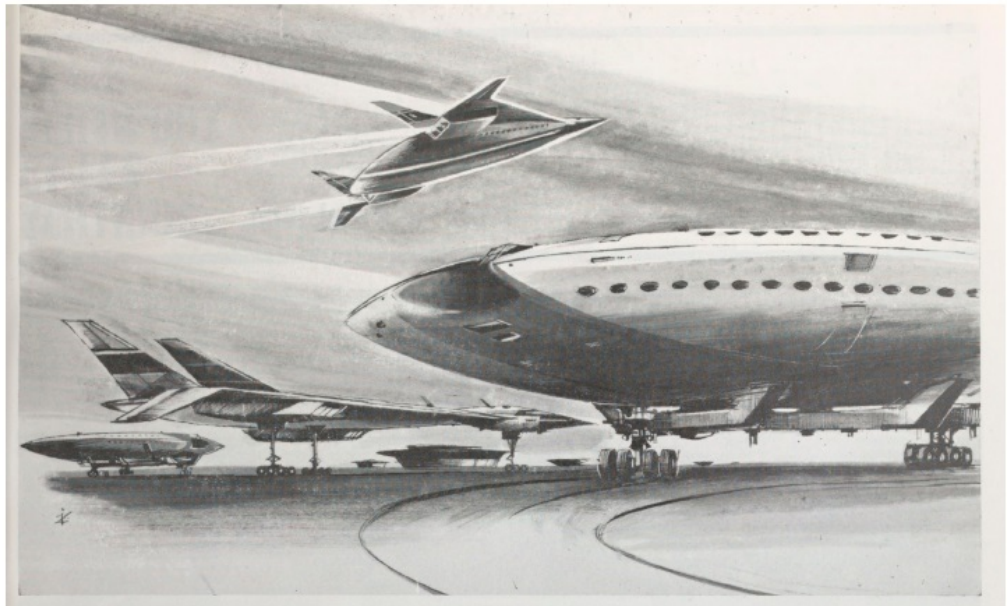


**Авиация
Ретрофутуро
Проекты
Будущего
из
Секретпроектов
и Техника-Молодежи**

**Проекты ТМ 1960го
копируют проекты
США 50х Ойлингера**

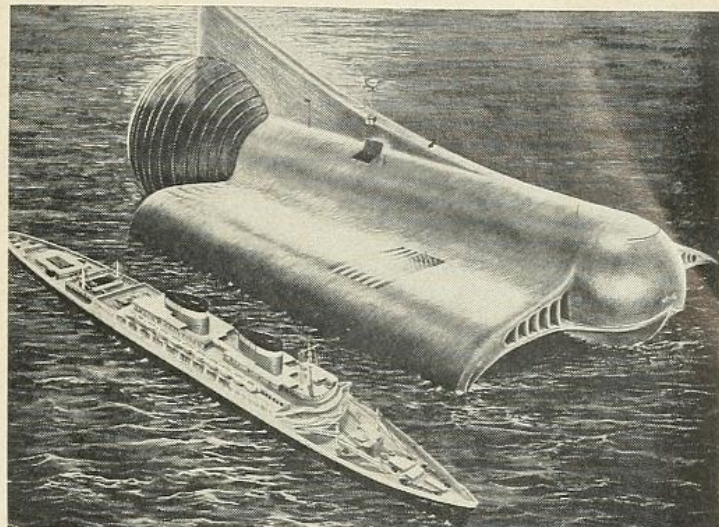


In next 20 years . . .

Fantastic Vehicles Will Be Realities



NUCLEAR SHIP of the 1970-1975 period. Could be *Antares*-type vehicle, first major application of the *Rover* type fission reactor rocket.



ADVANCED NUCLEAR spacecraft of 1980, could be the *Aldebaran*. S.S. United States illustrates the scale of this 50,000 ton vehicle.

by John F. Judge

An increasing amount of vigorous interest in the developments of the next twenty years in space is being displayed by some of the nation's largest missile manufacturers.

Long-range studies are arriving at concepts which might seem to the layman to be at home in fantasy—but are nonetheless based on hard technical knowledge.

An effort just completed at The Martin Co. anticipates developments in the coming two decades such as—

- *Antares*—a nuclear vehicle of the *Rover* propulsion type, weighing up to 20 million lbs. and capable of soft landing 4 million lbs. payload on the moon.

- *Aldebaran*—an advanced nuclear vehicle in the 50,000-ton class, rivaling the S.S. United States in size but with lunar capabilities.

This latest study is reported here as a result of *MISSILES AND ROCKETS*' continuing interest in the subject.

Postulating an intelligently planned and enthusiastically supported national space program—and assuming that the current effort will continue to be aggressively pushed on a broad front by industry and government, Dandridge M. Cole, Martin-Denver's senior advanced planning specialist, produced an analysis outlining the trend toward

low-cost, high-performance, manned spacecraft.

In the beginning of the report, Cole examines the effect of structural improvements on the gross weight-to-payload ratio (G/L) of vehicles. The prevailing skepticism over the possibility of transporting several tons over extended reaches of space is understandable, says Cole, since all we have been



SUCCESSOR TO *Saturn* could be *Arcturus* employing two Rocketdyne F-1 engines. This is a logical replacement for *Nova* in terms of economy and development speed.

able to accomplish is in the nature of the *Vanguard* and *Discoverer* shots—the average ratio involved here is about 400 to 1.

Considering lunar landings, the G/L ratio goes as high as 4000 to 1 with current propellant systems—again supporting conservatism.

But Cole points out that the expected G/L for *Vega* was only 700 and for *Saturn* is down to around 500. These reductions were due almost entirely to structural improvements.

Further, with current propellants, the G/L for a three-stage lunar landing vehicle can be lowered from 1000 to 1 down to 500 to 1 by raising the average propellant fraction (propellant weight divided by gross weight minus payload) from 0.86 to 0.89.

A 50% increase in propellant performance through high-energy chemicals would bring the G/L down to 200 for a propellant fraction of 0.76. Even greater reductions can be had through nuclear concepts such as *Rover*.

The upshot of all this is that large performance gains can be made from improvements in structural efficiency—particularly through increase in vehicle size.

- **Larger vehicles**—Cole says that the initial impetus for increasing the vehicle size and gross weight is founded in the need to place large manned payloads in orbit, and instruments on the

moon. *Saturn* will effectively meet these requirements.

Beyond *Saturn*—which is just about capable of one-way manned lunar missions—there is a need for manned round trip abilities which can be satisfied by increasing the gross weight to 2.4 million lbs. (*Arcturus*) or 4.8 million lbs. (*Nova*). Some improvement in structural efficiency is to be expected.

The Martin scientist said that this is the area in which further increases in weight no longer result in propellant fraction improvements. This is the point at which the nuclear-propelled vehicle becomes superior to the chemical rocket. The reason is that the fixed weight items have become negligible when compared to the entire vehicle.

The large fixed weights of shielding in nuclear vehicles provide another incentive for an increase in size. The development and production costs in both systems do not increase as fast as the vehicle size, because the weight increase is in low-cost structural metals. Now the cost picture begins to change for the better in relation to the vehicle size.

In the gross weight vs. time chart, the broken line represents Cole's earlier advanced planning curve plotted during the 1955-58 period. Today this curve seems highly conservative, but Cole points out that as late as mid-1958 the idea of building vehicles of over 2 million lbs. by 1977 "... seemed to many to be too great a strain on the imagination."

It is interesting to note that the new curve shows the growth of U.S.

vehicles may have started with the all-U.S. *Vikings* rather than with the modified and rebuilt German V-2 rockets.

• **Specific impulse**—The relation of an increase in propulsion performance to the gross weight to payload ratio shows that three-stage vehicles with current propellant systems having vacuum specific impulse in the 300 second or lower range do not have the energy to provide efficient transportation to the moon. This changes as the I_{sp} increases to about 400 seconds.

When the I_{sp} is 600 the values of G/L reach 15 to 1, a very efficient level. The *Rover* nuclear rocket concept I_{sp} level reaches values of 800 and the staging requirement falls to just two, since little is gained with a third stage in terms of efficiency. At an I_{sp} of 1000, one stage almost equals three; in the advanced nuclear area of around 1700, the G/L drops to about 3 to 1—better than present commercial jets on a 5000-mile flight.

Current chemical propellants already have vacuum specific impulses above 300 seconds, and Cole expects that 320 seconds should be reached in the near future. Vacuum values cannot be attained in the atmosphere so an I_{sp} of 260 seconds more reasonably represents present sea level values. In anticipating the increase in specific impulse, Cole deducts the energy losses in overcoming drag and gravity and plots the average against time. Numbers taken from the curve can be inserted directly in the equation

$$\Delta V = I_{sp} \ln \lambda$$

to give the velocity change for each

stage. The value I is the adjusted specific impulse and λ is the ratio of gross weight to empty weight.

The Martin expert estimates that by 1965, large high-energy chemical upper-stage engines powered by LOX and liquid hydrogen will be in general use. Vacuum I_{sp} will then range above 400 seconds. He further anticipates the use of the atmosphere in stepping up performance. Initially this will take the former of afterburners and other methods of adding air to the rocket exhaust.

Even these early methods of incorporating the atmosphere into the propulsion system would have effective specific impulse values well over 500 and as high as 600 seconds. This means the average I_{sp} for all stages should exceed 450 seconds.

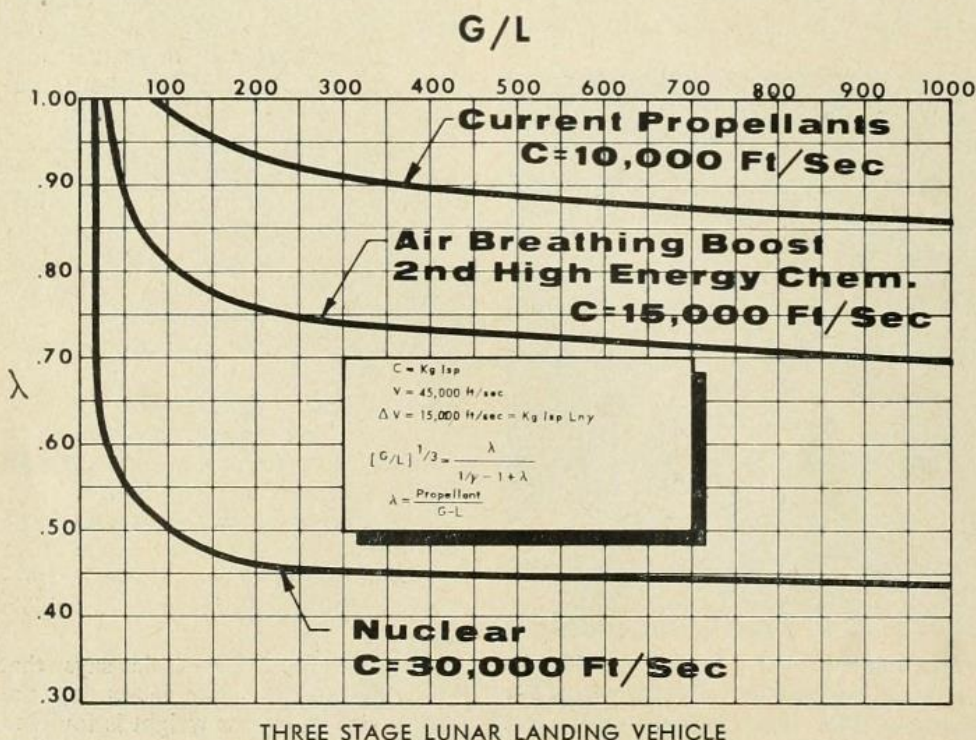
Cole finds substantial agreement among propulsion experts that the early nuclear rockets should be in use by 1970. These engines will have I_{sp} ranges from 700 to 900 seconds and will probably find extensive use in upper stages. By this time air-breathing first-stage systems should be in the neighborhood of 900 seconds, providing an overall vehicle average of about 800 seconds.

When the flight performance gains outlined in the first section of the study are combined into advanced vehicles, the capabilities are startling. Cole chose the amount of payload soft-landed on the moon as the performance parameter in considering the total effects of the improvements.

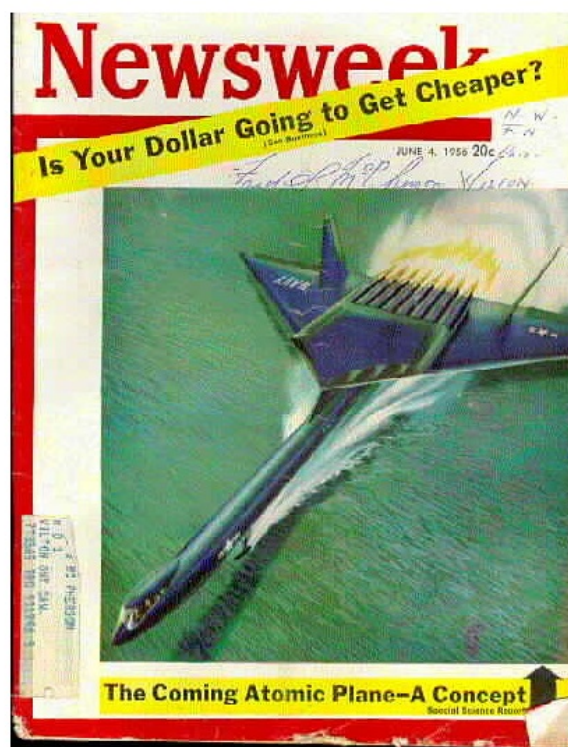
• **Underestimation?**—In this respect the Martin scientist notes a lack of appreciation of the lunar payload capabilities which can reasonably be expected of the 1970-1980 period.

Two tendencies contribute heavily to this indifference. The first is the habit of considering each improvement individually instead of combining them and the second is the general, unrealistic conservatism and excessive caution hindering extrapolation beyond current accomplishments.

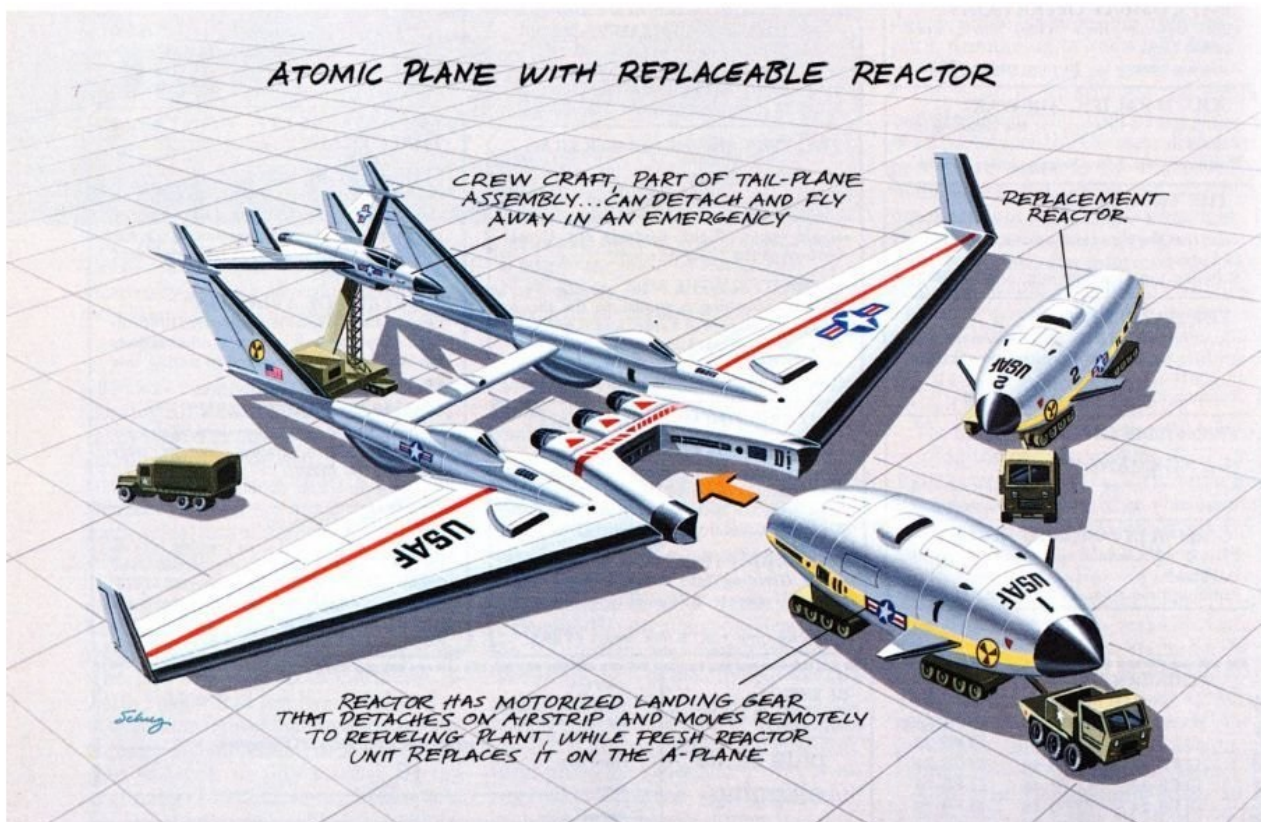
In his analysis, Cole begins by considering the *Vega*, *Centaur* and *Saturn* vehicles. Although the *Vega* was cancelled, it represents the payload capability attainable with an *Atlas* or *Titan* with essentially no modification except the addition of an upper stage. The original *Vega*, an *Atlas* plus a *Vanguard* first stage, could softly land 500 lbs. on the moon. If the upper stages added to either *Atlas* or *Titan* used high-energy chemical propulsion systems, this payload could increase to 1000 lbs. The particular high-energy upper stage planned for the *Atlas* in the early 60's involves a LOX and liquid hydrogen system and is desig-



EFFECT of improvements in structural efficiency of three-stage lunar landing vehicle.



ATOMIC PLANE WITH REPLACEABLE REACTOR



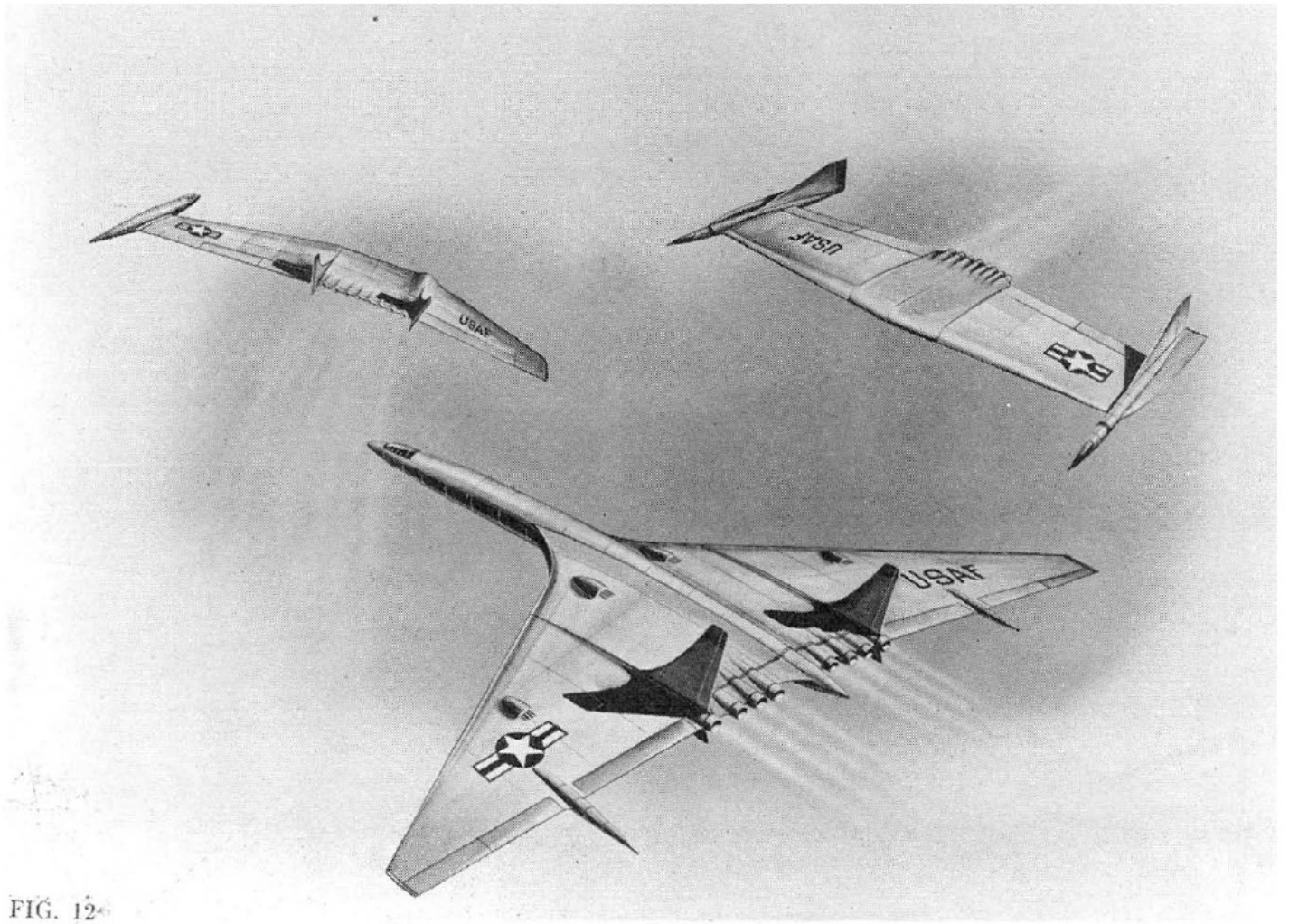


FIG. 12

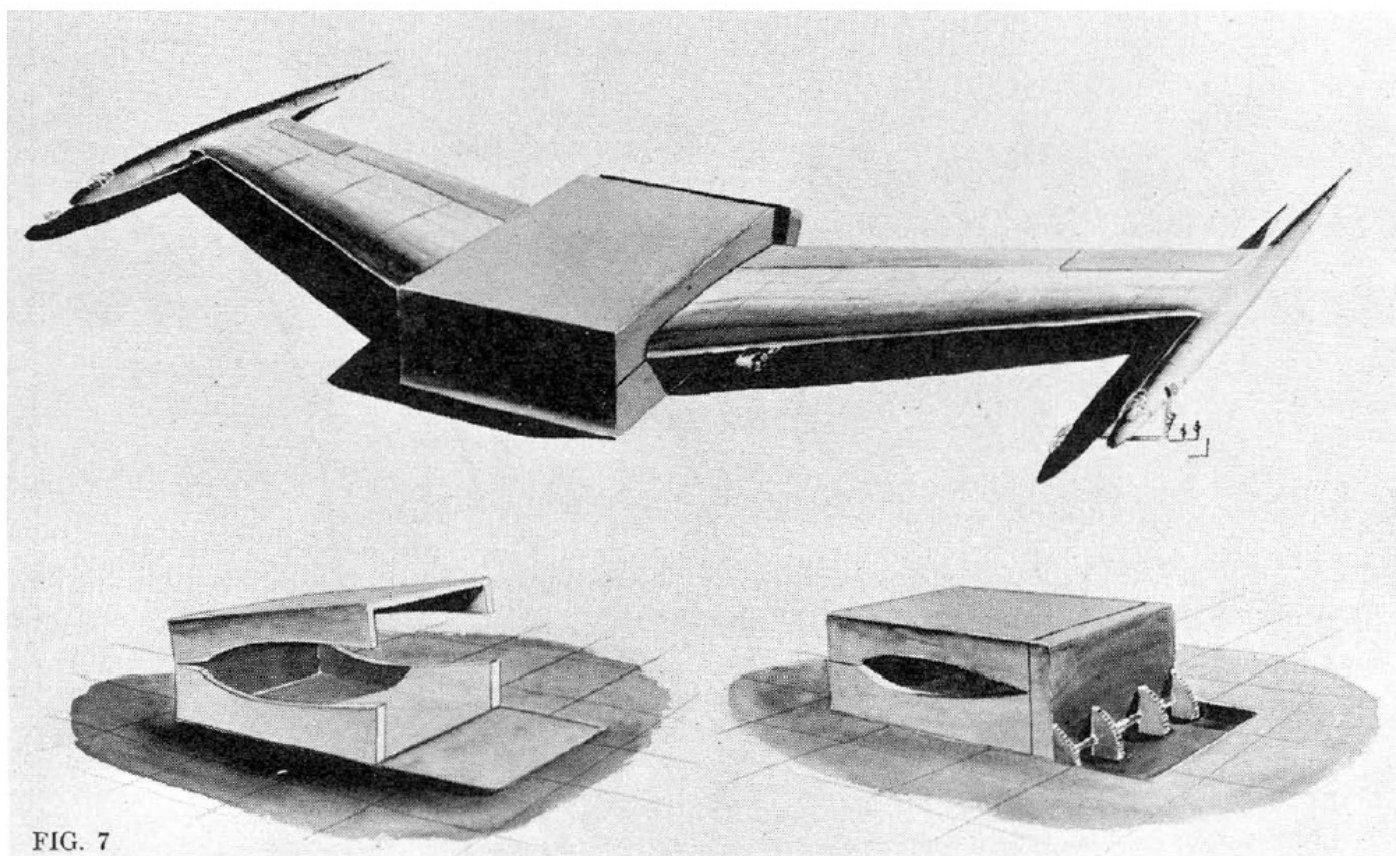


FIG. 7

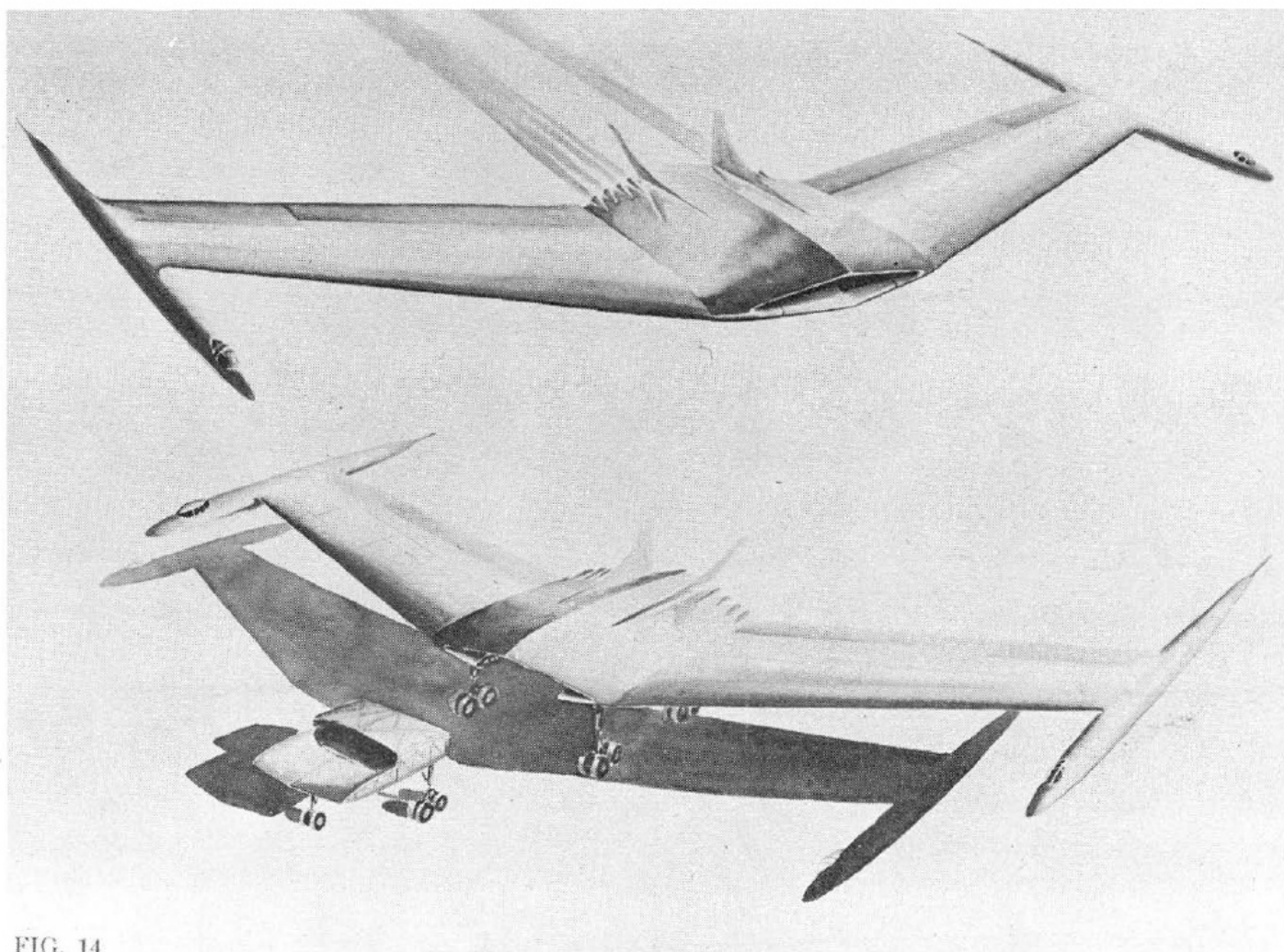
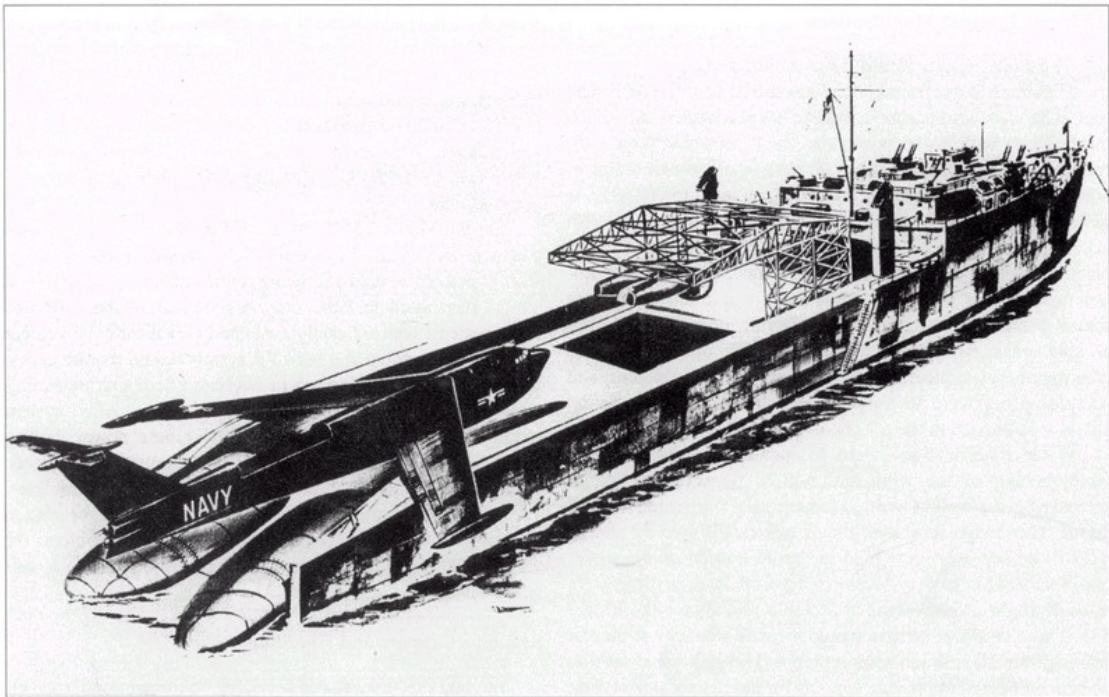
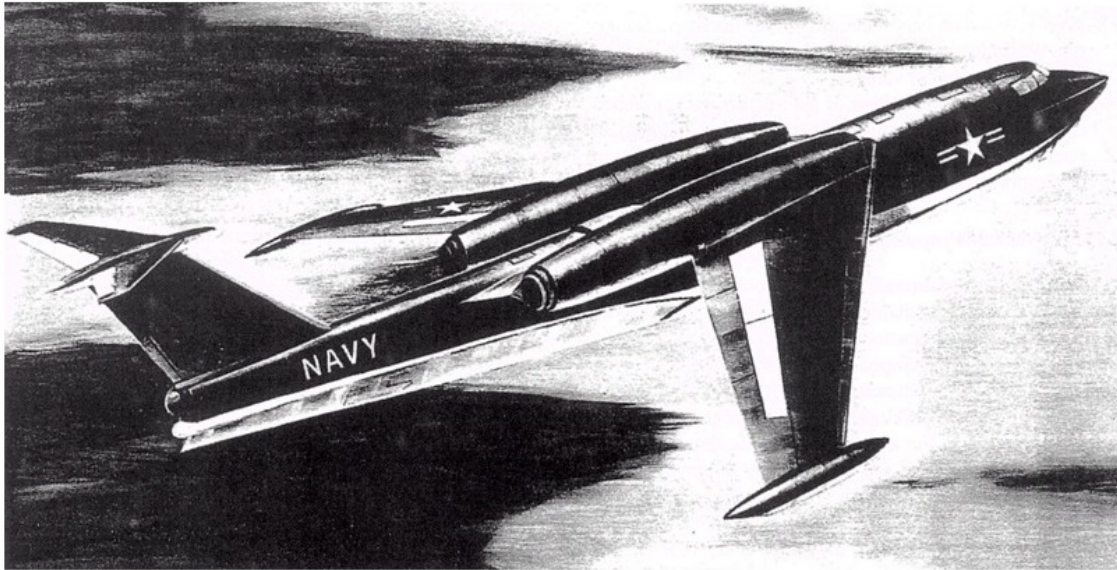
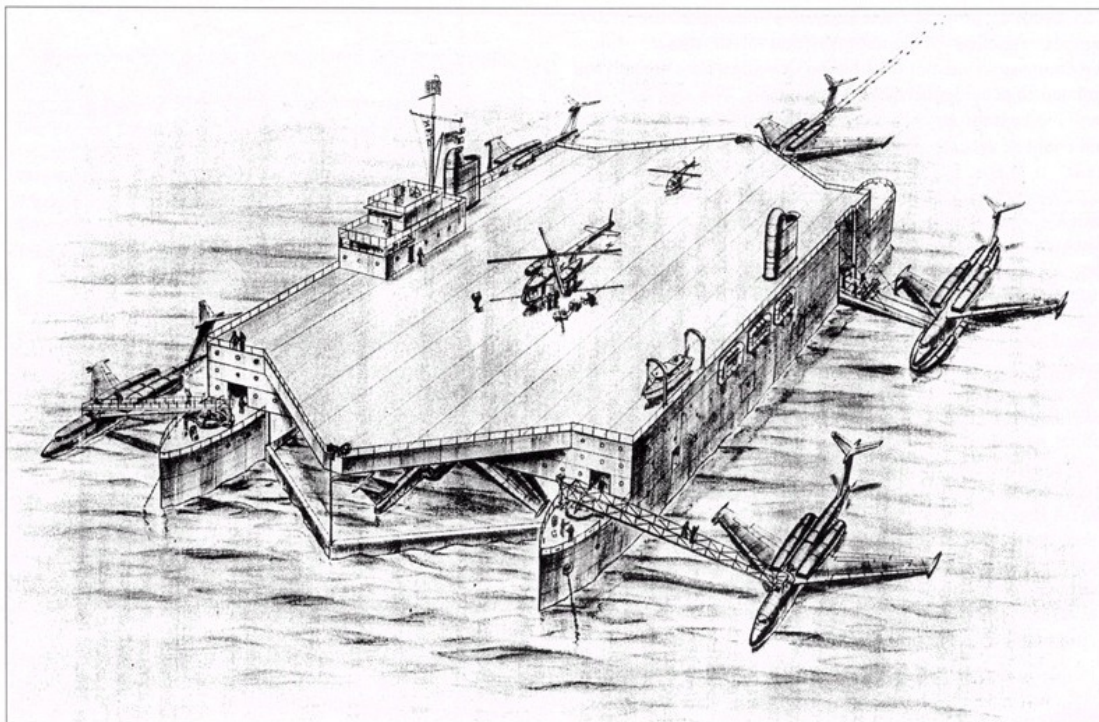


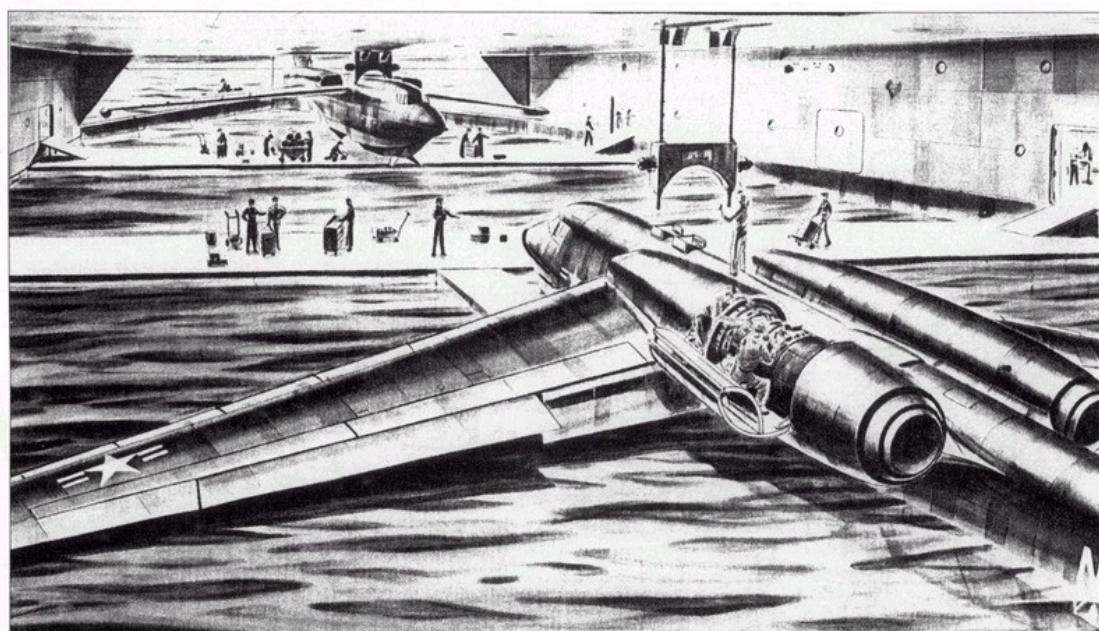
FIG. 14



Artist's Conception of a Modified LSD Configuration Tender



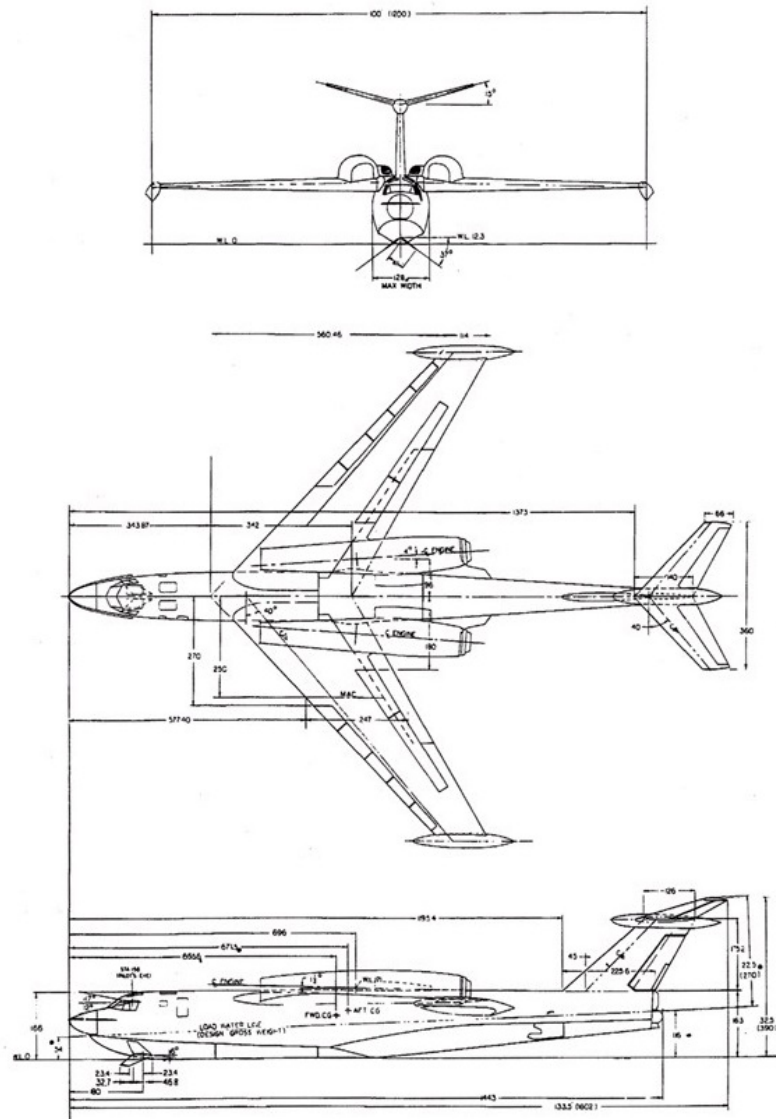
Artist's concept of a catamaran tender.



Artist's concept of a catamaran tender - interior.

Table 1 - Martin Model 331-1 (CFR) Design Characteristics

Surface areas		Weights and Balance			
Wing	1,900 sq ft			Hull	
T.E. Flaps	264 sq ft		(lb)	Sta.	% MAC
L.E. Flaps (slats)	136 sq ft	Weight Empty & Useful Load	185,665	670.9	37.8
Spoilers	158 sq ft	Maximum Fuel Load	22,500	565.0	
Horizontal Tail	257 sq ft	Design Bomb Load	7,600	500.0	
Elevator	60 sq ft	Design Gross Weight	215,765	653.9	31.0
Vertical Tail (total)	214 sq ft	Maximum Bomb Load	20,000		
Rudder (aft of hinge)	44 sq ft				



Model 331-1 (CFR) Three-View
CIRCULATING FUEL REACTOR

QUALCUNO FABBRICA GIÀ

BOMBARDIERI

Bisogna guardarsi dalla fantasia; bisogna considerare con gran sagacia (ed anzi, in quest'epoca, con molti grani di sale) quanto si va dicendo e soprattutto, quanto si predice; ma non si possono ignorare alcune precise « possibilità » suscettibili, nel volgere di non molto tempo, di divenire tangibili realtà sconvolgendo il nostro attuale modo di vivere e di pensare.

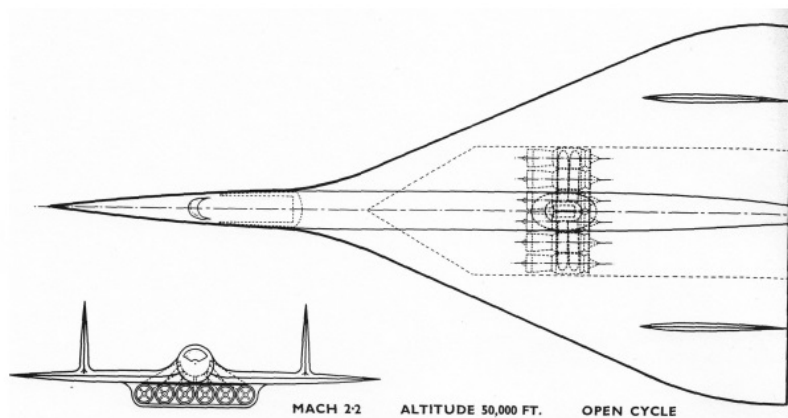
Fra queste « possibilità » vi è quella

A MOTORE

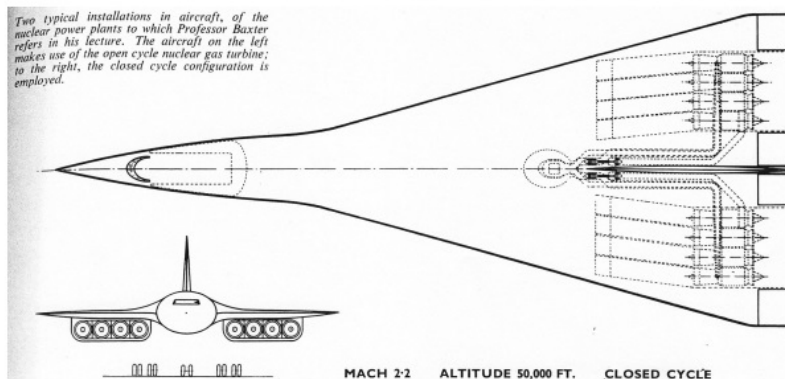
atomico non è che per ragioni contingenti, ma potrebbe trattarsi benissimo e ce lo augureremmo ben volentieri di un aeroplano da trasporto, di un cargo aereo, di (al capisco, entro certi limiti) di un turismo aereo mosso da

ATOMICO?

fin da oggi: più o meno, i motori del calore che la sua trasformazione con-



Two typical installations in aircraft, of the nuclear power plants to which Professor Baxter refers in his lecture. The aircraft on the left makes use of the open cycle nuclear gas turbine; to the right, the closed cycle configuration is employed.



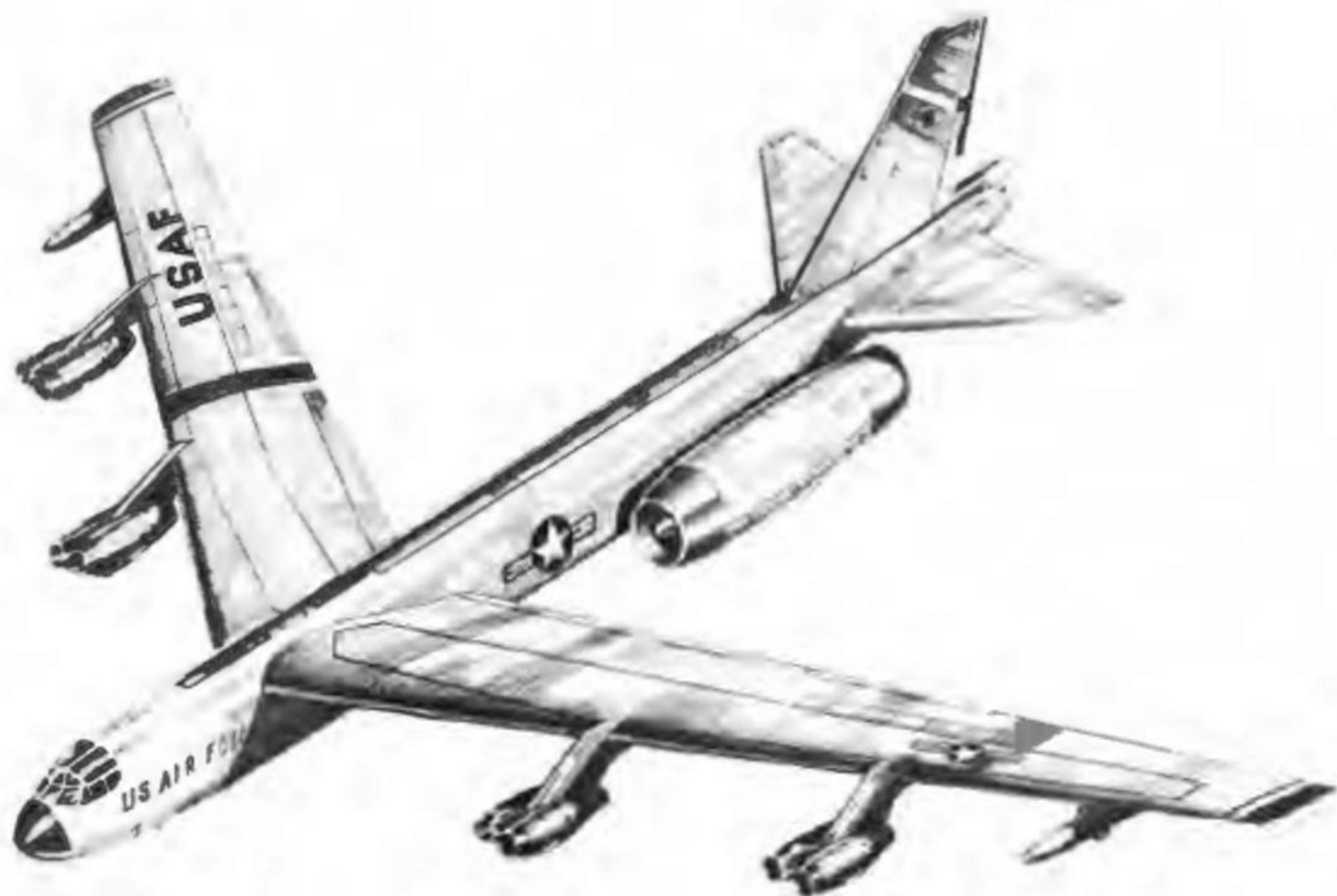


Fig. 2.17 -- B-52 flying test bed

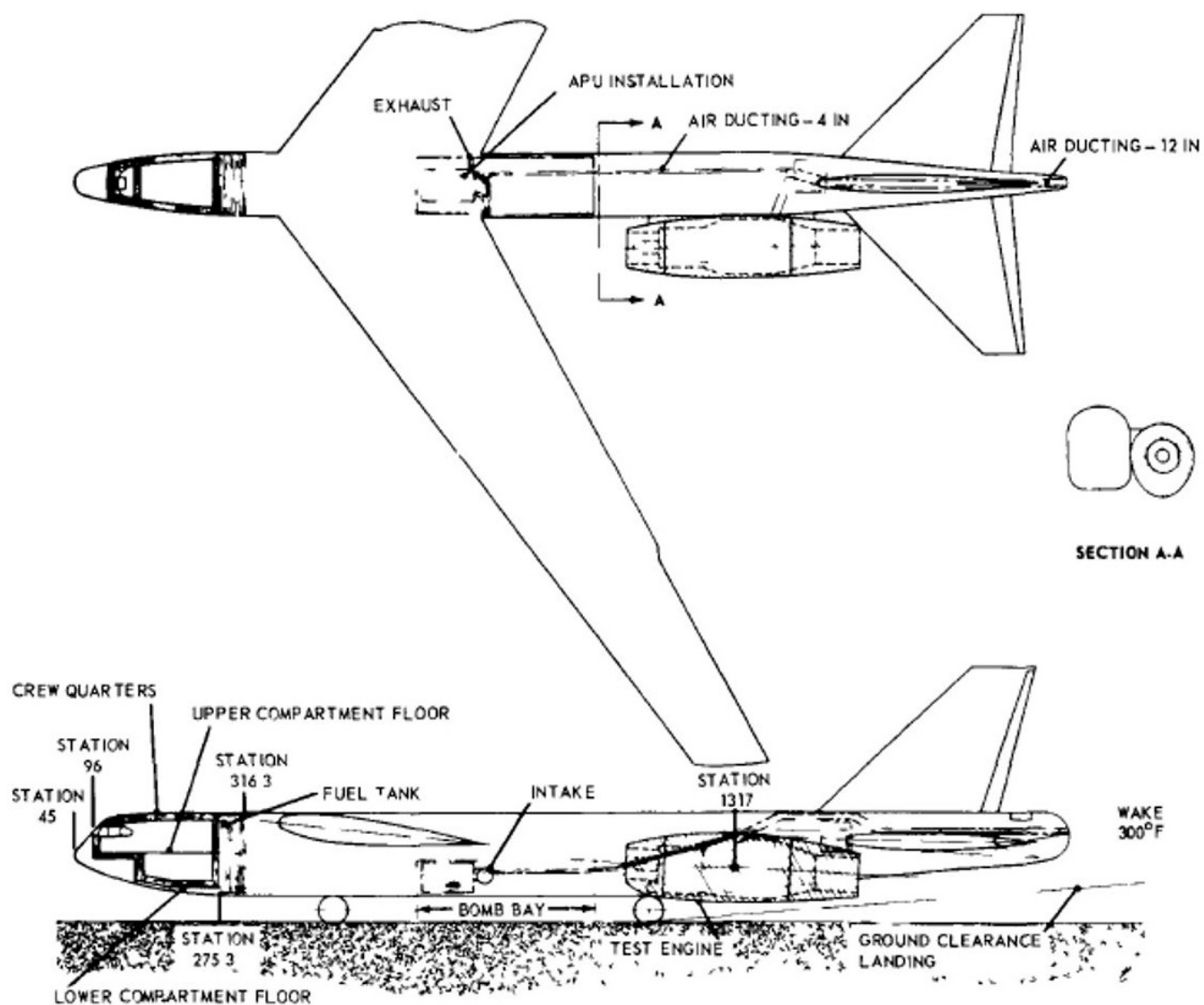
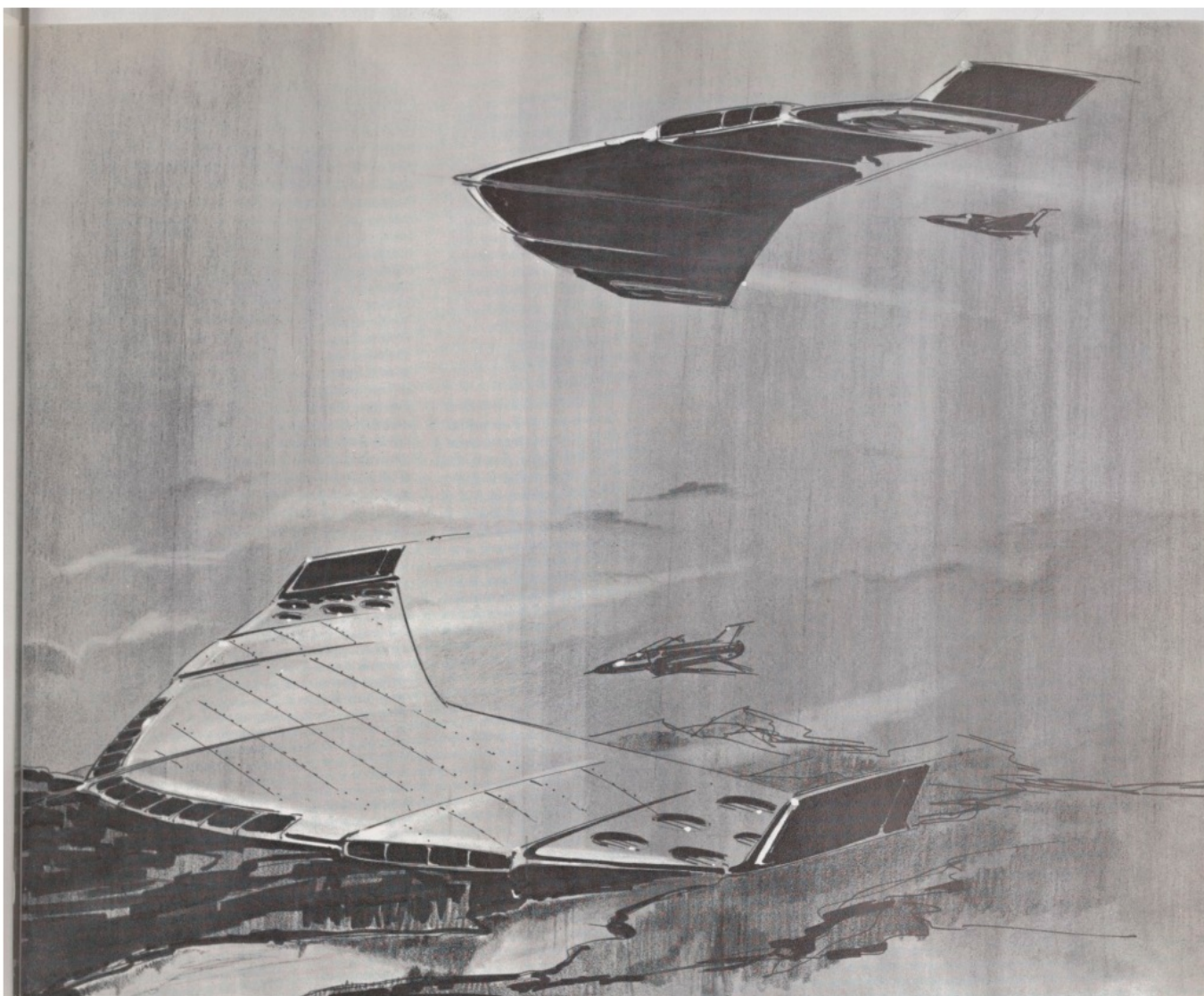


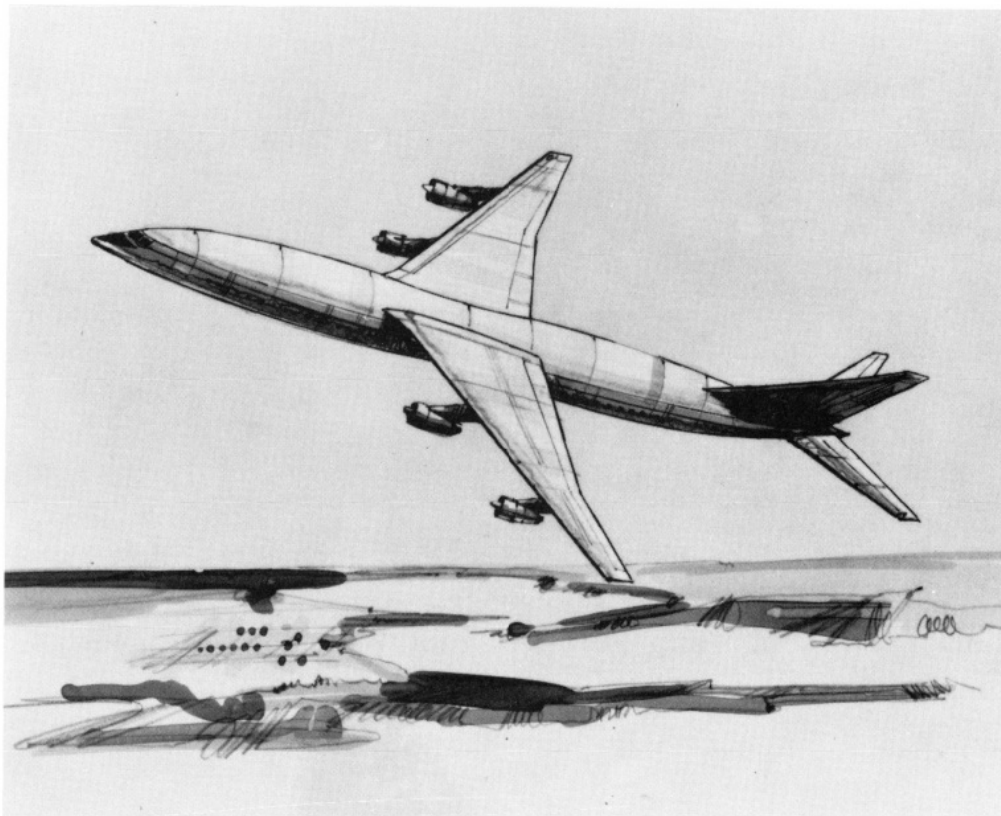
Fig. 2.19 - General arrangement of B-52 aircraft with XNJ140E-1 power plant



Avion subsonique « nucléaire »

L'aile volante dont l'envergure et l'épaisseur maximales atteignent respectivement 150 mètres et 10 mètres est propulsée en croisière par des turboréacteurs à chauffe nucléaire. L'appareil décolle et atterrit verticalement sur coussins d'air. Il peut être chargé et déchargé en vol.

dessin de Jean THOPRIEX



Wings for tomorrow. Here is artist's drawing of atom-powered 600-passenger subsonic airliner. Plane would have unlimited range. It could operate from airports that serve today's jets.

Admiral lends a hand to the Atomic Airplane

Radiation effects being studied in special laboratory

The flight date of the first atom-powered airplane may well be advanced as the result of a study being conducted by Admiral for the U.S. Air Force. The problem is to determine the effects of nuclear radiation on electronic components.

All types of electronic components... such as tubes, resistors, condensers, capacitors and coils... are first bombarded by neutrons to make them radioactive prior to observation and testing.

Admiral has equipped a special nucleonics laboratory to make this study. Test equipment is set up within heavily shielded "hot cells" and operated by remote controls outside each room. One of the "hot cells" contains environmental chambers for testing the radioactive components under extreme temperature and altitude conditions. The laboratory also contains shielded underground storage facilities and a cobalt 60 source of gamma radiation as powerful as some atomic reactors.

Working with radioactive materials is not new to Admiral. For the past seven years the company has been engaged in designing, manufacturing and testing radiation measurement equipment. In this connection Admiral engineers have contributed much to the combined nucleonic-electronic sciences.

Admiral
CORPORATION

Government Laboratories Division, Chicago 47

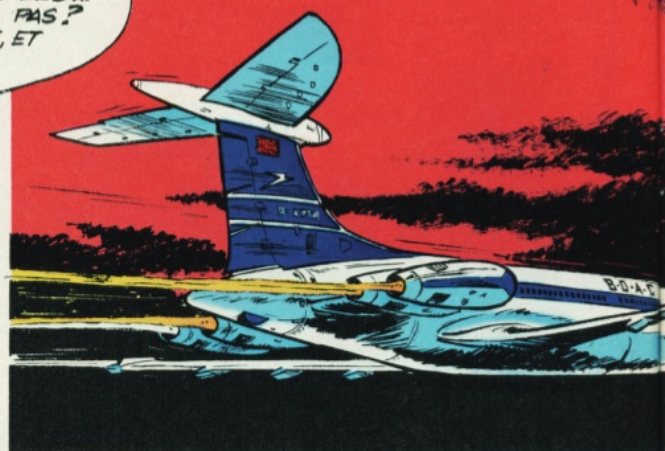
LOOK TO **Admiral** FOR
RESEARCH • DEVELOPMENT • PRODUCTION
IN THE FIELDS OF:

COMMUNICATIONS UHF AND VHF • MILITARY TELEVISION
RADAR • RADAR BEACONS AND IFF • RADIAC
TELEMETRY • DISTANCE MEASURING
MISSILE GUIDANCE • CODERS AND DECODERS
CONSTANT DELAY LINES • TEST EQUIPMENT



Facilities Brochure describing
Admiral plants, equipment and ex-
perience sent on request.

ENGINEERS: The wide scope of work in progress at
Admiral creates challenging opportunities in the field of
your choice. Write Director of Engineering and Research,



LE DIRIGEABLE PRÉPARE

Les ingénieurs en aéronautique se grattent la tête. L'avion, c'est très beau, mais ça coûte cher. Pour le rendre économique, on tâche de le faire aussi gros que possible afin qu'il puisse transporter d'un seul coup deux ou trois cents passagers. Il doit être également en mesure de sauter d'Europe en Amérique en quelques heures. Tel sera, par exemple, le Concorde.

Mais un avion comme le Concorde ne conviendra pas pour des distances moins importantes, comme Paris-Berlin ou Londres-Vienne.

Les appareils actuels présentent déjà des inconvénients que ne résoudront pas les Concorde: ils réclament des pistes démesurées. Certes, on étudie le décollage vertical, mais quel que soit le type de décollage adopté un jour, de toute façon, les avions consacrent un tiers de leur poids au carburant et aux moteurs. Ça fait autant de poids en moins réservé pour les passagers ou les marchandises.

Sur ce plan-là, trains et bateaux, quoique plus lents, font encore la nique aux avions.

Pourtant cette situation pourrait bien changer. Des ingénieurs anglais et américains sont allés chercher un revenant au musée de l'histoire de l'aéronautique, un revenant qui pourrait bien sillonner notre ciel d'ici quelques années: le dirigeable.

Voici le temps de la revanche.

Le dirigeable? Ce vieux coucou, encombrant, instable, déporté par le moindre souffle atmosphérique, exigeant un mât d'arrimage pour accoster, incapable de s'immobiliser sur l'aérodrome par tempête et, de surcroît, terriblement explosif? Allons donc!

Tout ça, c'était vrai il y a trente ans. Les moteurs étaient imparfaits et les dirigeables utilisaient, pour se sustenter, l'hydrogène, gaz excessivement explosif. En 1938, le dirigeable allemand «Hindenburg», pourtant parfait à bien des égards, s'embrasa comme une torche à la suite d'un court-circuit, au moment d'atterrir en Amérique. Il était gonflé à l'hydrogène!

C'est drôle à constater, mais l'aviation et l'astronautique ont contribué à renflouer l'aéronef. En effet:

- **LE GAZ.** L'hydrogène est remplacé par l'hélium. En 1938, on y regardait à deux fois avant de l'utiliser. Les ballons de baudruche, enfermés dans la carcasse du dirigeable, n'étant pas totalement imperméables, laissaient s'échapper une partie du gaz. On ne pouvait se payer le luxe d'employer de l'hélium, qui est trop coûteux. Aujourd'hui, les «cellules à gaz» seront faites de pellicules synthétiques ou de plastique, totalement étanches.

- **LES MOTEURS.** Diesel à 12 cylindres avec groupe compresseur-turbine à gaz ou, mieux encore, turbines à gaz alimentées par pile atomique, installée au cœur de l'aérostât.

- **LA STABILITÉ,** garantie par la puissance accrue des moteurs actuels. A l'arrêt, le dirigeable sera aussi immobile (même par grand vent) qu'un hélicoptère grâce à de petits réacteurs stabilisateurs du genre de ceux utilisés sur les satellites artificiels.

Dans un ballon : avion - hélicoptère - paquebot.

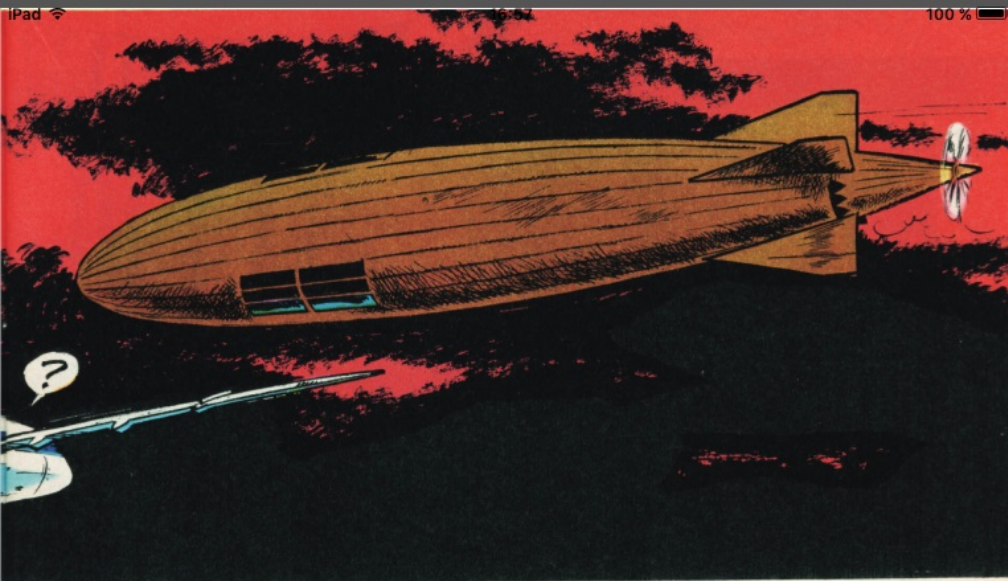
Le professeur Francis Morse et son équipe, de l'Université de Boston (USA), ont dressé les plans du futur dirigeable-paquebot ou cargo. Ses caractéristiques sont étonnantes.

- Plus de 300 mètres de long sur 60 de largeur.
- 3 moteurs totalisant 6 000 CV.
- 400 passagers, équipage de 95 hommes.
- Vitesse maximum de 180 km.-h. Vitesse de croisière: 170 km.-h.
- Rayon d'action: illimité. Peut faire le tour du monde sans jamais atterrir.

Sa vitesse sera suffisante pour évincer l'avion dans bien des domaines. Ce dernier se cantonnera pour les grandes distances ou pour satisfaire les gens très pressés.

Mais l'avion reste une cage de métal dans laquelle on doit rester immobile, assis.

Au contraire, comme le paquebot, le dirigeable com-



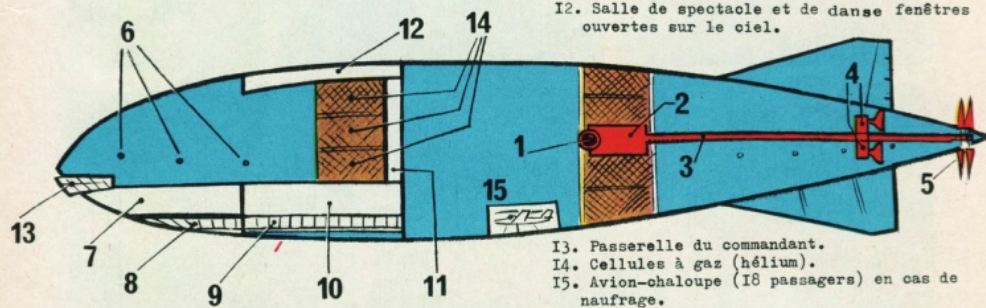
SA REVANCHE

portera pont, salons, salle à manger, bars, cabines, cinéma, avec en plus un avantage appréciable: absence de tangage et roulis. Pas de mal de mer!

En tant que cargo, il se révélera imbattable. Il pourra s'immobiliser totalement au-dessus d'une usine, charger des marchandises, qu'il ira porter directement à l'usine destinataire, plus vite et mieux qu'un simple camion.

Vous verrez: le plus léger que l'air aura le dernier mot!

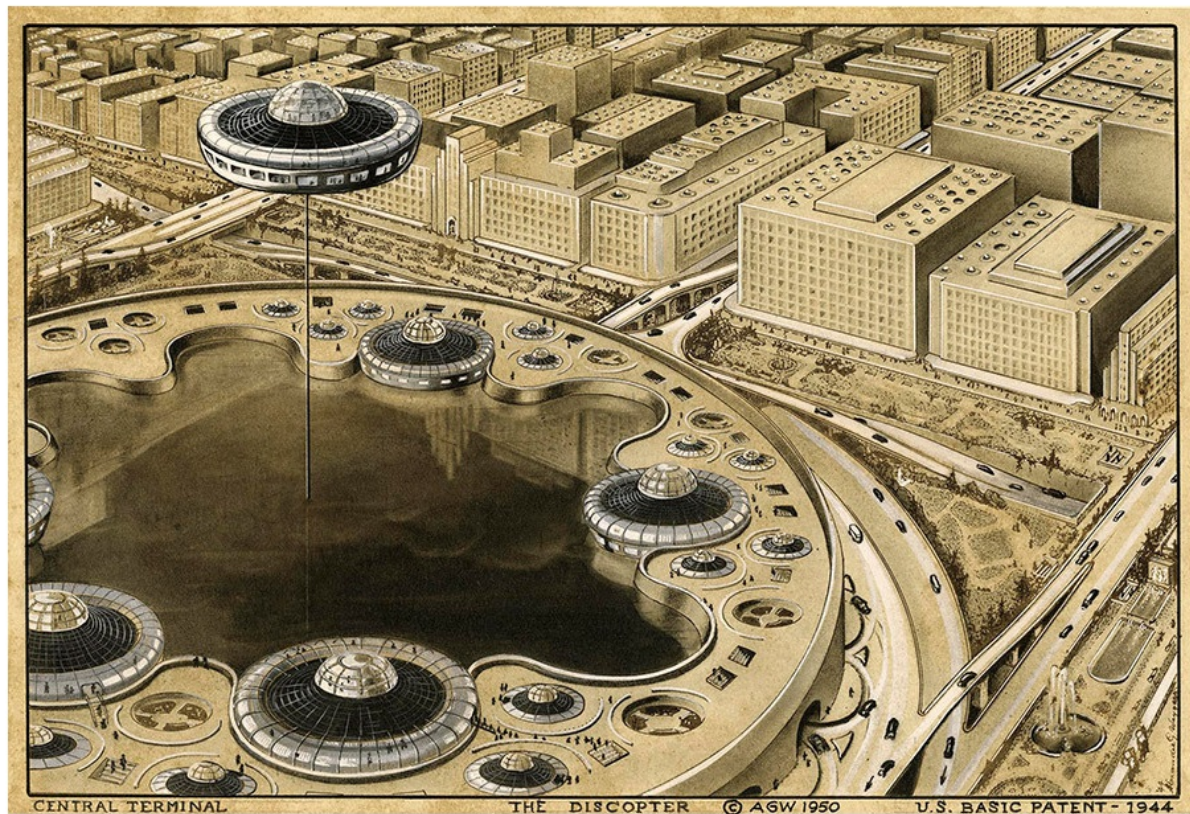
FRANCIS MORSE, UN JULES VERNE AMERICAIN
QUI MET LA MAIN A LA PATE ...

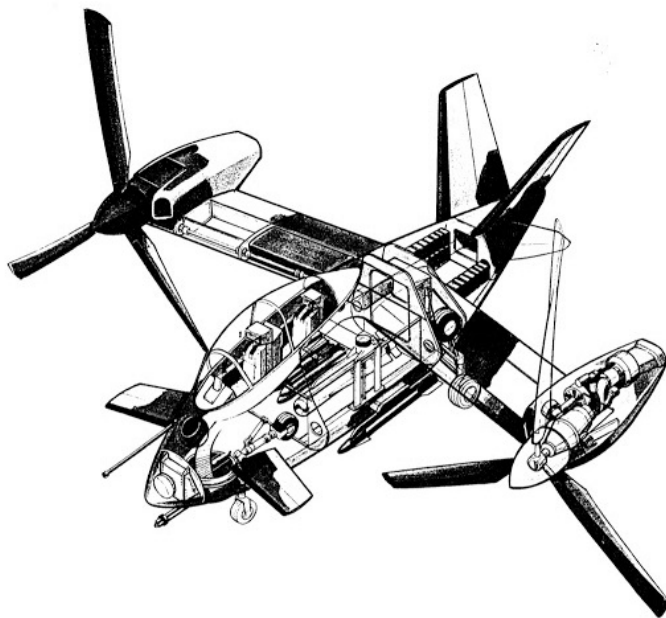


- I. Réacteur atomique. Combustible céramique refroidi au lithium.
2. Echangeur.
3. Gaz caloporteur destiné aux turbines.
4. Turbines à gaz.
5. 2 hélices de 18 M. de diamètre.
6. Réacteurs-stabilisateurs.
7. Grand hall.
8. Salle à manger.
9. Cabines.
10. Pont couvert, grandes baies vitrées tournées vers le bas.
- II. Ascenseurs donnant accès à la salle de spectacle.
12. Salle de spectacle et de danse fenêtres ouvertes sur le ciel.

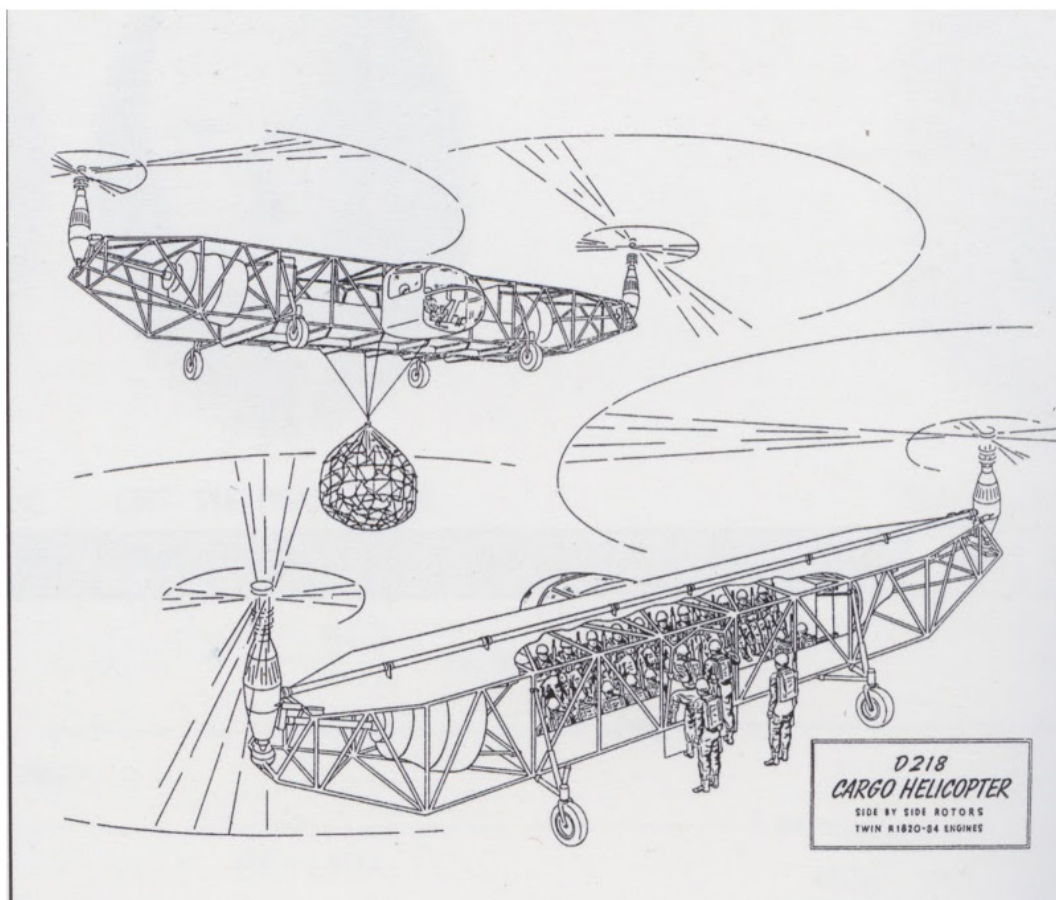
Le projet de Francis Morse, professeur à l'Université de Boston (USA) ressuscite l'esprit de Jules Verne: le paquebot volant

13. Passerelle du commandant.
14. Cellules à gaz (hélium).
15. Avion-chaoupe (18 passagers) en cas de naufrage.





Bell Helicopter **TEXTRON** 28899

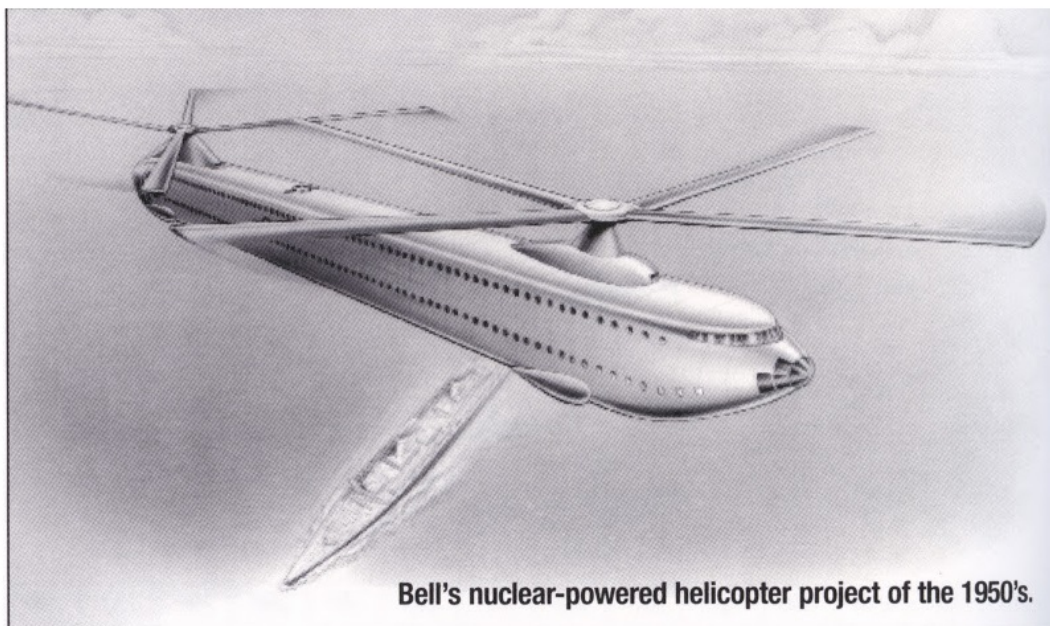




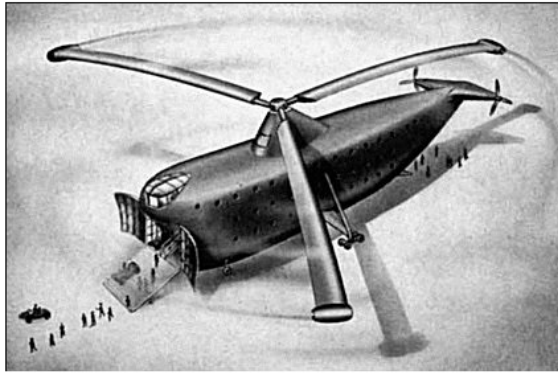
WESTLAND AIRCRAFT LTD

YEOVIL ENGLAND

EUROPE'S LARGEST HELICOPTER FACTORY PRODUCING MACHINES OF ALL CAPACITIES FOR ALL PURPOSES



Bell's nuclear-powered helicopter project of the 1950's.



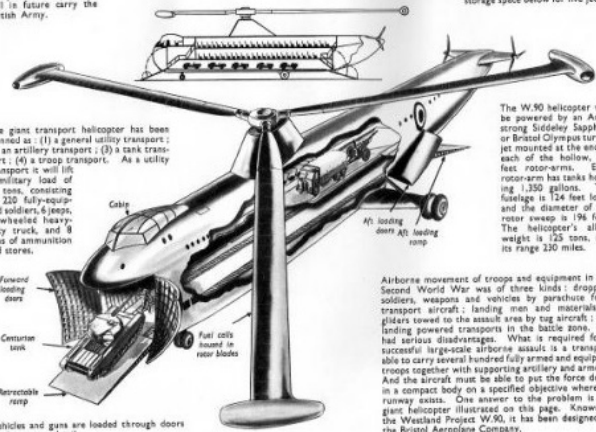
Jet-propelled helicopters each lifting 36 tons of troops and equipment will in future carry the British Army.

The Jet Helicopter

The top sketch shows the helicopter as a transport for 450 infantrymen on two decks, with storage space below for five jeeps.

The giant transport helicopter has been planned as: (1) a general utility transport; (2) an artillery transport; (3) a tank transport; (4) a troop transport. As a utility transport it will lift a military load of 36 tons, consisting of 250 fully-equipped soldiers, 6 jeeps, 16-wheeled heavy-duty truck, and 8 tons of ammunition and stores.

Vehicles and guns are loaded through doors at the nose and tail.



The W.90 helicopter will be powered by an Armstrong Siddeley Sapphire or Bristol Olympus turbojet mounted at the end of each of the hollow, 98-foot rotor-arms. Each rotor-arm has tanks holding 1,350 gallons. The fuselage is 124 feet long, and the diameter of the rotor sweep is 196 feet. The helicopter's all-up weight is 125 tons, and its range 350 miles.

Airborne movement of troops and equipment in the Second World War was of three kinds: dropping soldiers, weapons and vehicles by parachute from transport aircraft; landing men and materials in gliders towed to the assault area by tug aircraft; and landing powered transports in the battle zone. All had serious disadvantages. What is required for a successful large-scale airborne assault is a transport able to carry several hundred fully armed and equipped troops together with supporting artillery and armour. And the aircraft must be able to put the force down in a compact body on a specified objective where no runway exists. One answer to the problem is the giant helicopter illustrated on this page. Known as the Westland Project W.90, it has been designed by the Bristol Aeroplane Company.

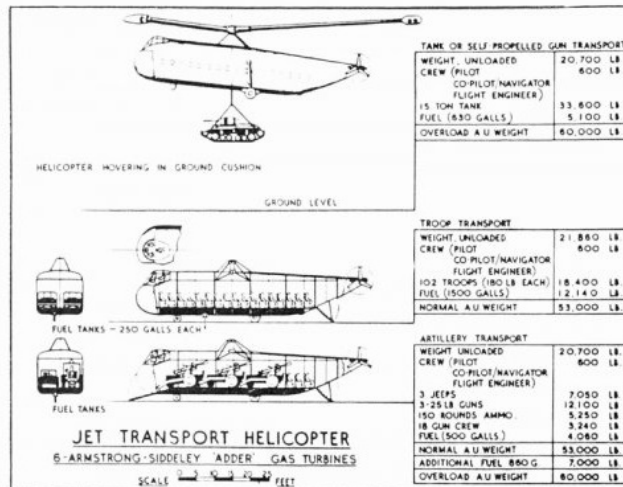
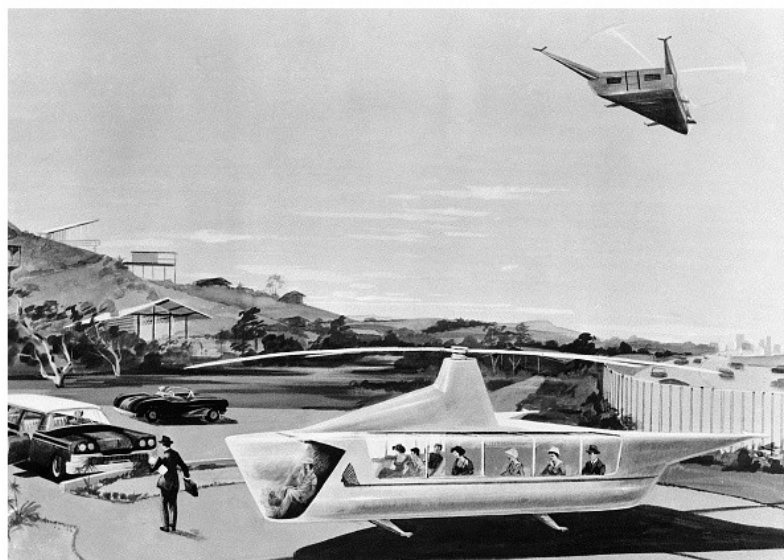
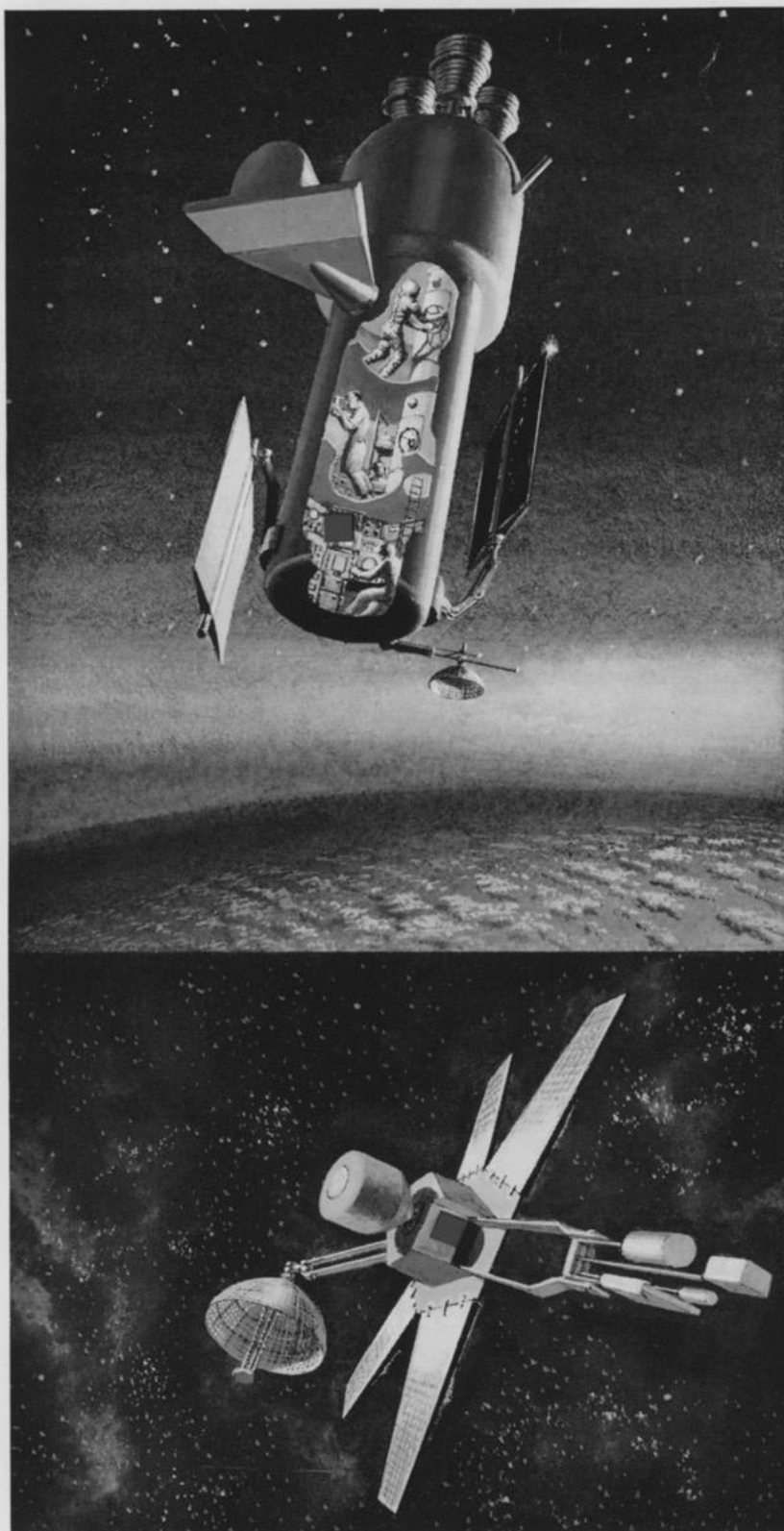


FIG. 14—First example—Typical loads.





Coming ■ the one-for-all space guidance system. In the past, each new space mission has meant development of a new guidance system, requiring precious time and large expenditures. □ Now, to provide maximum reliability and performance at the least cost, Sperry is studying development, under government sponsorship, of a single "core" universal space guidance system, with optional "building block" add-ons for a wide span of missions in a wide variety of space vehicles. This new design will offer accuracy and reliability, with system flexibility. The in-depth experience for this new concept—inertial guidance and control, infra-red optics, digital and analog techniques, radar, displays and system management—is all "under one roof" at Sperry. **INERTIAL DIVISION, Sperry Gyroscope Co., Great Neck, New York.**

SPERRY
DIVISION OF
SPERRY RAND
CORPORATION

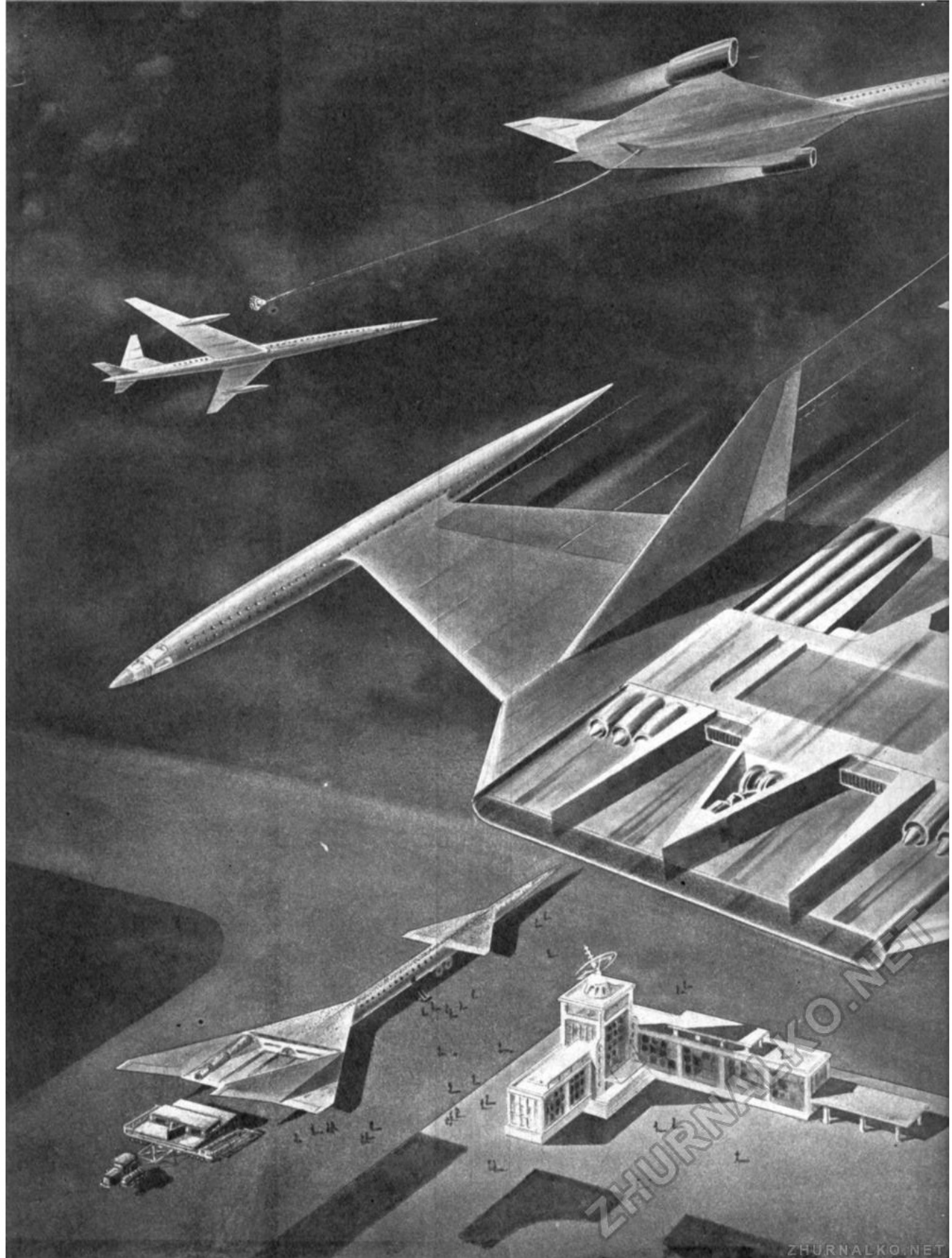


Цвет и жизнь

ТЕХНИКА-
МОЛОДЕЖИ

7
1960

ZHURNALOKO.NET



СТУДЕНЧЕСКИЙ ПРОЕКТ

«Накими могут быть самолеты завтрашнего дня?» Этот вопрос волнует нашу молодежь. Мы обратились к художнику С. Наумову, к студенту МГУ А. Жигареву и инженеру Д. Пипко с просьбой набросать хотя бы отдаленные контуры самолетов будущего. На рисунке вы видите несколько типов воздушных гигантов. В центре — самолет, пассажирские кабины которого вынесены на концы крыльев, а силовая реактивная установка находится в центральной части. Вверху справа — самолет-буксировщик ведет за собой два пассажирских лайнера. Вверху слева показана возможность заправки самолета в полете со специального самолета-заправщика.

Бесконечно разнообразен будет мир воздушных гигантов завтрашнего дня. Что принесет нам творческая мысль в будущем — это дело самого будущего. Пусть дерзает наша молодежь!



Ч 60

ZHURNALKO.NET